Claims:

1. A process for producing a pharmaceutical composition, which comprises:

(a) providing a plurality of containers;

(b) providing a plurality of excipient solutions;

(c) providing a plurality of compound solutions, each having dissolved therein a pharmaceutical compound;

(d) dispensing into each container at least one of the excipient solutions with one of the compound solutions so as to form an intimate mixture, a property of each mixture being varied in different containers;

(e) incubating the mixture;

(f) determining onset of solid-state nucleation;

(g) selecting a pharmaceutical compound/excipient combination whereby onset of solid-state nucleation is retarded; and

(h) producing a pharmaceutical composition comprising the pharmaceutical compound/excipient combination.

2. A process according to claim 1, wherein:

(a) the property varied in step (d) comprises identity or amount of the excipient or the pharmaceutical compound;

(b) each solution comprises an aqueous solution;

(c) the mixture simulates gastric juices or intestinal fluids;

(d) the compound solution is supersaturated;

(e) the plurality of containers are presented in a multiple well plate format;

(f) at least the step of dispensing is performed with automated liquid handling apparatus;

(g) the intimate mixture is formed using a mixer;

(h) the step of incubating the mixture is performed at constant temperature;

(i) the temperature is approximately 37 degrees C;

(j) the onset of solid-state nucleation is determined by measuring the light scattering of the mixture;

(k) the light scattering is measured using a nephelometer;

(l) the process further comprises a step of determining the crystallinity of the product of solid-state nucleation before selecting the pharmaceutical compound/excipient combination;

(m) the crystallinity is determined by birefringence screening; or

(n) a pharmaceutical composition is obtained.

3. A process for producing a pharmaceutical composition, which comprises:

(a) providing a plurality of containers;

(b) providing a plurality of excipient solutions;

(c) providing a plurality of compound solutions, each having dissolved therein a pharmaceutical compound;

(d) dispensing into each container one of the excipient solutions with one of the compound solutions so as to form an intimate mixture, the excipient being varied in different containers;

(e) incubating the mixture;

(f) determining onset of solid-state nucleation;

(g) selecting an excipient which is found to retard onset of solid-state nucleation; and

(h) producing a pharmaceutical composition comprising the pharmaceutical compound and the selected excipient.

4. A pharmaceutical composition obtained by a process according to claim 3.

5. A method for assessing excipient-mediated retardation of solid-state nucleation of a pharmaceutical compound, which method comprises:

(a) providing a plurality of containers;

(b) providing a plurality of excipient solutions;

(c) providing a plurality of compound solutions, each having dissolved therein a pharmaceutical compound;

(d) dispensing into each container one of the excipient solutions with one of the compound solutions so as to form an intimate mixture, a property of each mixture being varied in different containers;

(e) incubating the mixture;

(f) determining onset of solid-state nucleation; and

(g) ranking the property of the mixture according to time of onset of solid-state nucleation.

6. A method for screening excipients that retard solid-state nucleation of a pharmaceutical compound, which method comprises:

(a) providing a plurality of containers;

(b) providing a plurality of excipient solutions;

(c) providing a plurality of compound solutions, each having dissolved therein a pharmaceutical compound;

(d) dispensing into each container one of the excipient solutions with one of the compound solutions so as to form an intimate mixture, the excipient being varied in different containers;

(e) incubating the mixture;

(f) determining onset of solid-state nucleation; and

(g) ranking the excipient according to time of onset of solid-state nucleation.

7. A pharmaceutical composition comprising:

(a) a salt or a liquid form of an API having low solubility in gastric fluid conditions;

(b) a precipitation retardant; and

(c) an optional enhancer;

wherein the composition retards crystallization/precipitation of the drug for at least 5 minutes in gastric fluid conditions.

8. The pharmaceutical composition according to claim 7, wherein:

(a) the precipitation retardant is a surfactant;

(b) the surfactant has an interfacial tension of less than 10 dyne/cm or a surface tension of less then 42 dyne/cm;

(c) the surfactant comprises an ether functional group;

(d) the surfactant is a poloxamer;

(e) the poloxamer has an interfacial tension of less than 10 dyne/cm or surface tension less then 42 dyne/cm;

(f) the surfactant is present at a concentration equal to or above the critical micelle concentration;

(g) the composition comprises an enhancer;

(h) the composition comprises a cellulose ester as an enhancer;

(i) the composition comprises HPC or HPMC as an enhancer;

(j) the composition comprises HPC as an enhancer;

(k) crystallization/precipitation is retarded for at least 10 minutes;

(l) crystallization/precipitation is retarded for at least 15 minutes;

(m) crystallization/precipitation is retarded for at least 20 minutes;

(n) crystallization/precipitation is retarded for at least 25 minutes;

(o) crystallization/precipitation is retarded for at least 30 minutes;

(p) crystallization/precipitation is retarded for at least 35 minutes;

(q) crystallization/precipitation is retarded for at least 40 minutes;

(r) crystallization/precipitation is retarded for at least 45 minutes;

(s) crystallization/precipitation is retarded for at least 60 minutes;

(t) the API is a sulfonamide API;

(u) the sulfonamide API is a benzene sulfonamide;

(v) the benzene sulfonamide is celecoxib, deracoxib, valdecoxib, rofecoxib or eturicoxib;

(w) the benzene sulfonamide is in the form of an alkali metal or alkaline earth metal salt;

(x) the aqueous solubility of the API is not more than 0.1 mg/mL when measured at 37 degrees C;

(y) the aqueous solubility of the API is not more than 10 mg/mL when measured at 37 degrees C;

(z) the salt is an alkali metal or alkaline earth metal salt;

(aa) the metal is sodium, potassium, lithium, or calcium; or

(bb) the salt is crystalline.

9. A process for producing a pharmaceutical composition for delivering a supersaturated concentration of a drug having low aqueous solubility, which process comprises intimately mixing together components:

(a) a salt or a liquid form of an API having low solubility in gastric fluid conditions;

(b) a precipitation retardant; and

(c) an optional enhancer.

10. The process for producing a pharmaceutical composition according to claim 9, wherein:

(a) the API comprises a sulfonamide API;

(b) the sulfonamide API is a benzene sulfonamide;

(c) the benzene sulfonamide is celecoxib, deracoxib, valdecoxib, rofecoxib or eturicoxib;

(d) the benzene sulfonamide is in the form of an alkali metal or alkaline earth metal salt;

(e) the aqueous solubility of the API is not more than 0.1 mg/mL when measured at 37 degrees C; or

(f) the aqueous solubility of the API is not more than 10 mg/mL when measured at 37 degrees C.

11. The pharmaceutical composition according to claim 7, wherein:

(a) the bioavailability of the composition orally administered is at least 70%;

(b) the bioavailability of the composition orally administered is as least 80%;

(c) the bioavailability of the composition orally administered is as least 85%;

(d) the bioavailability of the composition orally administered is as least 90%;

(e) the bioavailability of the composition orally administered is as least 95%;

(f) the C_{max} is at least 2 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(g) the C_{max} is at least 3 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(h) the C_{max} is at least 4 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(i) the C_{max} is at least 5 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(j) the C_{max} is at least 10 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(k) the C_{max} is at least 25 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(l) the C_{max} is at least 50 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(m) the C_{max} is at least 100 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(n) the C_{max} is at least 250 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(o) the C_{max} is at least 500 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(p) the C_{max} is at least 750 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(q) the C_{max} is at least 1000 fold greater than a neutral form in vivo or in an in vitro dissolution assay;

(r) the bioavailability of the composition is at least 50% greater than a neutral form;

(s) the bioavailability of the composition is at least 75% greater than a neutral form;

(t) the bioavailability of the composition is at least 2 fold that of a neutral form;

(u) the bioavailability of the composition is at least 3 fold that of a neutral form;

(v) the bioavailability of the composition is at least 4 fold that of a neutral form;

(w) the bioavailability of the composition is at least 5 fold that of a neutral form;

(x) the bioavailability of the composition is at least 10 fold that of a neutral form; or

(y) a linear dose response is generated upon administration from a dose of up to 7 mg/kg.

12. A pharmaceutical composition comprising a salt or liquid form of a sulfonamide API having low solubility in gastric fluid conditions.

13. The pharmaceutical composition of claim 12, wherein:

(a) the sulfonamide is a benzene sulfonamide;

(b) the benzene sulfonamide is celecoxib, deracoxib, valdecoxib, rofecoxib, or eturicoxib;

(c) the benzene sulfonamide is celecoxib;

(d) the pharmaceutically acceptable salt is an alkali metal or an alkaline earth metal salt;

(e) the alkali metal or alkaline earth metal salt is sodium, lithium, potassium, or calcium;

(f) the salt is crystalline; or

(g) the salt is amorphous.

14. A pharmaceutical composition comprising a sodium salt of celecoxib.

15. The pharmaceutical composition of claim 14, wherein the salt form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 3.57, 8.91, and 10.69 degrees;

(b) said form is a celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 11.29, 16.69, and 17.13 degrees;

(c) said form is a celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 9.49, 18.29, and 19.85 degrees;

(d) said form is a celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 3.57, 10.69, and 19.85 degrees;

(e) said form is a celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 13.69, 19.85, and 21.53 degrees;

(f) said form is a celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 11.29, 22.39, and 23.35 degrees;

(g) said form is a celecoxib sodium salt and said X-ray diffraction pattern comprises a peak at 19.85 degrees;

(h) said form is a celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 8.91 and 10.69 degrees; or

(i) said form is a celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 3.57, 10.69, 13.69, and 19.85 degrees.

16. A pharmaceutical composition comprising a potassium salt of celecoxib.

17. The pharmaceutical composition of claim 16, wherein the salt form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 9.11, 12.23, and 19.79 degrees;

(b) said form is a celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 9.11, 20.97, and 22.81 degrees;

(c) said form is a celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 12.23, 19.79, and 24.71 degrees;

(d) said form is a celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 8.13, 12.23, and 19.79 degrees;

(e) said form is a celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 4.99, 9.11, and 24.71 degrees;

(f) said form is a celecoxib potassium salt and said X-ray diffraction pattern comprises a peak at 19.79 degrees;

(g) said form is a celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 12.23 and 15.35 degrees; or

(h) said form is a celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 4.03, 10.61, 15.35, and 22.81 degrees.

18. A pharmaceutical composition comprising a lithium salt of celecoxib.

19. The pharmaceutical composition of claim 18, wherein the salt form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a celecoxib lithium salt and said X-ray diffraction pattern comprises peaks at 4.14, 9.04, and 10.71 degrees;

(b) said form is a celecoxib lithium salt and said X-ray diffraction pattern comprises peaks at 18.71, 20.52, and 23.00 degrees;

(c) said form is a celecoxib lithium salt and said X-ray diffraction pattern comprises peaks at 10.71, 18.71, and 21.55 degrees;

(d) said form is a celecoxib lithium salt and said X-ray diffraction pattern comprises peaks at 9.04, 10.71, and 12.47 degrees;

(e) said form is a celecoxib lithium salt and said X-ray diffraction pattern comprises peaks at 12.47, 15.75, and 20.52 degrees;

(f) said form is a celecoxib lithium salt and said X-ray diffraction pattern comprises a peak at 10.71 degrees;

(g) said form is a celecoxib lithium salt and said X-ray diffraction pattern comprises peaks at 9.04 and 15.08 degrees; or

(h) said form is a celecoxib lithium salt and said X-ray diffraction pattern comprises peaks at 12.46, 15.75, 20.52, and 21.55 degrees.

20. A pharmaceutical composition comprising a calcium salt of celecoxib.

21. The pharmaceutical composition of claim 20, wherein the salt form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a celecoxib calcium salt and said X-ray diffraction pattern comprises peaks at 7.82, 9.27, and 20.56 degrees;

(b) said form is a celecoxib calcium salt and said X-ray diffraction pattern comprises peaks at 3.91, 9.27, and 27.35 degrees;

(c) said form is a celecoxib calcium salt and said X-ray diffraction pattern comprises peaks at 11.66, 14.93, and 23.08 degrees;

(d) said form is a celecoxib calcium salt and said X-ray diffraction pattern comprises peaks at 9.27, 20.56, and 27.35 degrees;

(e) said form is a celecoxib calcium salt and said X-ray diffraction pattern comprises peaks at 16.96, 19.03, and 23.08 degrees;

(f) said form is a celecoxib calcium salt and said X-ray diffraction pattern comprises a peak at 9.27 degrees; or

(g) said form is a celecoxib calcium salt and said X-ray diffraction pattern comprises peaks at 3.91 and 20.56 degrees.

22. The pharmaceutical composition of claim 12, wherein the API is celecoxib and wherein the salt further comprises water or a solvent molecule.

23. The pharmaceutical composition of claim 22, wherein the solvent molecule is propylene glycol.

24. A pharmaceutical composition comprising celecoxib sodium salt propylene glycol solvate.

25. The pharmaceutical composition of claim 24, wherein the solvate form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 3.77, 7.57, and 11.33 degrees;

(b) said form is a celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 11.33, 18.69, and 20.65 degrees;

(c) said form is a celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 16.13, 22.69, and 24.77 degrees;

(d) said form is a celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 8.21, 18.69, and 22.69 degrees;

(e) said form is a celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 14.23, 20.65, and 24.77 degrees;

(f) said form is a celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises a peak at 3.77 degrees;

(g) said form is a celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 7.57 and 20.65 degrees; or

(h) said form is a celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 11.33, 16.13, 18.69, and 22.69 degrees.

26. The pharmaceutical composition of claim 24, wherein the celecoxib sodium salt propylene glycol solvate is a hydrate.

27. The pharmaceutical composition of claim 26, wherein the hydrate form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a hydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 18.43, 19.21, and 22.13 degrees;

(b) said form is a hydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 6.97, 13.93, and 19.45 degrees;

(c) said form is a hydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 3.47 and 21.27 degrees;

(d) said form is a hydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises a peak at 3.82 degrees;

(e) said form is a hydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 8.69, 18.45, and 20.84 degrees; or

(f) said form is a hydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 6.97 and 19.45 degrees.

28. The pharmaceutical composition of claim 24, wherein the celecoxib sodium salt propylene glycol solvate is anhydrous or a dihydrate.

29. A pharmaceutical composition comprising celecoxib potassium salt propylene glycol solvate.

30. The pharmaceutical composition of claim 29, wherein the solvate form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a celecoxib potassium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 3.75, 7.47, and 18.31 degrees;

(b) said form is a celecoxib potassium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 11.33, 18.31, and 21.73 degrees;

(c) said form is a celecoxib potassium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 15.65, 20.49, and 22.51 degrees;

(d) said form is a celecoxib potassium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 14.89, 18.31, and 24.97 degrees;

(e) said form is a celecoxib potassium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 15.65, 20.49, and 23.03 degrees;

(f) said form is a celecoxib potassium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 7.47, 15.65, and 22.51 degrees;

(g) said form is a celecoxib potassium salt propylene glycol solvate and said X-ray diffraction pattern comprises a peak at 3.75 degrees;

(h) said form is a celecoxib potassium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 7.47 and 18.31 degrees; or

(i) said form is a celecoxib potassium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 11.33, 15.65, 21.73, and 24.97 degrees.

31. The pharmaceutical composition of claim 29, wherein the celecoxib potassium salt propylene glycol solvate is anhydrous.

32. A pharmaceutical composition comprising celecoxib lithium salt propylene glycol solvate.

33. The pharmaceutical composition of claim 32, wherein the solvate form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a celecoxib lithium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 3.79, 11.41, and 15.93 degrees;

(b) said form is a celecoxib lithium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 18.29, 19.87, and 20.63 degrees;

(c) said form is a celecoxib lithium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 9.83, 20.63, and 25.09 degrees;

(d) said form is a celecoxib lithium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 8.19, 16.45, and 19.87 degrees;

(e) said form is a celecoxib lithium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 19.19, 21.13, and 25.09 degrees;

(f) said form is a celecoxib lithium salt propylene glycol solvate and said X-ray diffraction pattern comprises a peak at 11.41 degrees;

(g) said form is a celecoxib lithium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 18.29 and 20.63 degrees; or

(h) said form is a celecoxib lithium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 3.79, 8.19, 15.93, and 25.09 degrees.

34. A pharmaceutical composition comprising a trihydrate of celecoxib sodium salt propylene glycol solvate.

35. The pharmaceutical composition of claim 34, wherein the trihydrate form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a trihydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 6.95, 13.95, and 25.71 degrees;

(b) said form is a trihydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 3.43, 6.95, and 19.43 degrees;

(c) said form is a trihydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 11.83, 16.39, and 21.21 degrees;

(d) said form is a trihydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 10.25, 18.21, and 22.61 degrees;

(e) said form is a trihydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 12.95, 16.39, and 22.61 degrees;

(f) said form is a trihydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises a peak at 16.39 degrees;

(g) said form is a trihydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 6.95 and 21.21 degrees; or

(h) said form is a trihydrate of celecoxib sodium salt propylene glycol solvate and said X-ray diffraction pattern comprises peaks at 3.43, 10.25, 13.95, and 25.71 degrees.

36. A pharmaceutical composition comprising celecoxib sodium salt isopropanol solvate.

37. The pharmaceutical composition of claim 36, wherein the solvate form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a celecoxib sodium salt isopropanol solvate and said X-ray diffraction pattern comprises peaks at 3.43, 7.03, and 10.13 degrees;

(b) said form is a celecoxib sodium salt isopropanol solvate and said X-ray diffraction pattern comprises peaks at 11.75, 14.11, and 16.61 degrees;

(c) said form is a celecoxib sodium salt isopropanol solvate and said X-ray diffraction pattern comprises peaks at 17.61, 18.49, and 22.81 degrees;

(d) said form is a celecoxib sodium salt isopropanol solvate and said X-ray diffraction pattern comprises peaks at 10.13, 20.97, and 22.81 degrees;

(e) said form is a celecoxib sodium salt isopropanol solvate and said X-ray diffraction pattern comprises peaks at 17.61, 22.81, and 25.93 degrees;

(f) said form is a celecoxib sodium salt isopropanol solvate and said X-ray diffraction pattern comprises peaks at 7.03, 16.61, and 18.49 degrees;

(g) said form is a celecoxib sodium salt isopropanol solvate and said X-ray diffraction pattern comprises a peak at 16.61 degrees;

(h) said form is a celecoxib sodium salt isopropanol solvate and said X-ray diffraction pattern comprises peaks at 11.75 and 20.97 degrees; or

(i) said form is a celecoxib sodium salt isopropanol solvate and said X-ray diffraction pattern comprises peaks at 7.03, 14.11, 17.61, and 22.81 degrees.

38. A pharmaceutical composition comprising a co-crystal, which comprises celecoxib and nicotinamide.

39. The pharmaceutical composition of claim 38, wherein the co-crystal is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a co-crystal comprising celecoxib and nicotinamide and said X-ray diffraction pattern comprises peaks at 9.62, 17.78, and 20.44 degrees;

(b) said form is a co-crystal comprising celecoxib and nicotinamide and said X-ray diffraction pattern comprises peaks at 9.63, 22.10, and 24.70 degrees;

(c) said form is a co-crystal comprising celecoxib and nicotinamide and said X-ray diffraction pattern comprises peaks at 16.01, 19.31, and 21.19 degrees;

(d) said form is a co-crystal comprising celecoxib and nicotinamide and said X-ray diffraction pattern comprises peaks at 17.78, 20.44, and 23.80 degrees;

(e) said form is a co-crystal comprising celecoxib and nicotinamide and said X-ray diffraction pattern comprises peaks at 9.63, 16.01, and 19.31 degrees;

(f) said form is a co-crystal comprising celecoxib and nicotinamide and said X-ray diffraction pattern comprises a peak at 17.78 degrees;

(g) said form is a co-crystal comprising celecoxib and nicotinamide and said X-ray diffraction pattern comprises peaks at 3.77 and 9.63 degrees; or

(h) said form is a co-crystal comprising celecoxib and nicotinamide and said X-ray diffraction pattern comprises peaks at 7.56, 17.78, 19.31, and 22.10 degrees.

40. A pharmaceutical composition comprising a hydrate of celecoxib potassium salt.

41. The pharmaceutical composition of claim 40, wherein the hydrate form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a hydrate of celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 3.69, 8.99, and 13.35 degrees;

(b) said form is a hydrate of celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 10.65, 13.35, and 20.05 degrees;

(c) said form is a hydrate of celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 18.85, 21.45, and 22.39 degrees;

(d) said form is a hydrate of celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 3.69, 13.35, and 24.77 degrees;

(e) said form is a hydrate of celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 10.65, 18.85, and 26.71 degrees;

(f) said form is a hydrate of celecoxib potassium salt and said X-ray diffraction pattern comprises a peak at 20.05 degrees;

(g) said form is a hydrate of celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 3.69 and 13.35 degrees; or

(h) said form is a hydrate of celecoxib potassium salt and said X-ray diffraction pattern comprises peaks at 8.99, 18.85, 20.05, and 22.39 degrees.

42. A pharmaceutical composition comprising a hydrate of celecoxib sodium salt.

43. The pharmaceutical composition of claim 42, wherein the hydrate form is characterized by a powder X-ray diffraction pattern comprising peaks expressed in terms of 2-theta angles, wherein:

(a) said form is a hydrate of celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 3.51, 11.59, and 20.17 degrees;

(b) said form is a hydrate of celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 20.17 and 11.59 degrees;

(c) said form is a hydrate of celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 19.57, 21.55, and 31.67 degrees;

(d) said form is a hydrate of celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 3.51 and 8.89 degrees;

(e) said form is a hydrate of celecoxib sodium salt and said X-ray diffraction pattern comprises peaks at 12.97 and 20.43; or

(f) said form is a hydrate of celecoxib sodium salt and said X-ray diffraction pattern comprises a peak at 20.13.

44. The pharmaceutical composition of claim 42, wherein the hydrate form is a monohydrate or a trihydrate.

45. A pharmaceutical composition comprising a high energy species that drives supersaturation of an API in water, SGF, or SIF.